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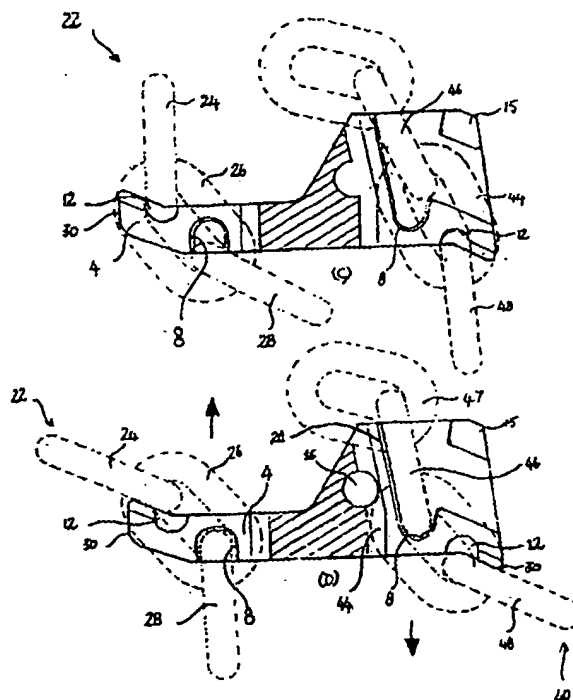
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(54) Title: CHAIN ENGAGING DEVICE

(57) Abstract

The invention relates to a chain engaging device (2) comprising a first surface (10) defining a groove (8) adapted to receive a portion of a first link (28), a second surface (14) including an area opposed to groove (8) and spaced from first surface (10) by a distance greater than the maximum gap between first link (28) and an adjacent co-planar link (24), rotation of link (26) intermediate first link (28) and adjacent co-planar link (24) when the portion of first link (28) is in groove (8) permitting movement of adjacent co-planar link (24) between a first position in which the portion of first link (28) cannot be withdrawn from groove (8) due to co-planar link (24) interfering with the area of second surface (14) and a second position in which the portion of first link (28) can be withdrawn from groove (8).



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Title: CHAIN ENGAGING DEVICE

TECHNICAL FIELD

The present invention relates to chain engaging devices adapted to join chains or to form loops in chains. However, it will be appreciated that the invention is not limited to this particular field of use and is applicable in any situation which requires releasable connection with a chain.

BACKGROUND ART

As is well known to those skilled in the art, conventional chains consist of a plurality of links each link being orthogonal to its neighbours. As used herein, the term "adjacent co-planar link" refers to the link which is not immediately adjacent to the link in suit but rather is the next link which lies in the same plane. Thus, each pair of adjacent co-planar links is joined by an orthogonal

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intermediate link. Accordingly, the "maximum gap" between adjacent co-planar links is the dimension between a pair of adjacent co-planar links when the chain is in tension. It will be appreciated that adjacent co-planar links can approach each other when the chain is not in tension.

Hitherto D-shackles comprising a generally U-shaped member (refer to Figure 1) receiving a threaded pin through the ends of the U have been used in applications requiring the joining of chains, forming of loops in the chain, coupling articles to a chain, or the like.

In practice D-shackles have a number of disadvantages. D-shackles often require special links to be inserted in the chain in order to adapt the chain to receive the shackle. For example, when joining two lengths of chain it may be necessary to add a special link to each of the adjacent ends of the lengths and the shackle is subsequently disposed intermediate the two special links to join the lengths. Furthermore, the threaded pin is sometimes known to bind to the U-shaped member as a result of rust, deformation under load or other reasons. When this happens the D-shackle is particularly difficult to undo and may have to be replaced. Another deficiency of D-shackles is that a D-shackle, appropriately sized for a given chain, will only

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bear approximately two thirds the rated load of the chain.

Also known in the art are Clevis claw hooks (refer to Fig 2). Such hooks comprise two fingers adapted to overlay and engage a link on either side of an adjacent link. However, these hooks must be maintained in tension in order to be maintained in positive engagement with the link.

Figures 8 and 9 also show a form of claw hook which represents somewhat of an improvement over the Clevis claw hooks shown in Figure 2. These devices include a groove which receives a portion of a first link and a transverse slot between two hook arms which accommodates the adjacent link. The first link bears against the bottom of the groove when the device is under load. A mechanism is also typically provided to retain the first link captively within the groove when the chain is unloaded. This takes the form of a simple manual latch which is non-load bearing.

Whilst these devices represent an improvement over the prior art described above, it has been found that the particular form of load bearing engagement does not allow the maximum load capacity of the chain to be achieved. This is because the load bearing link is supported on each side immediately adjacent that portion of the link

- 4 -

engaged by the adjacent link when the chain is under load. Consequently, the engaged link fails in shear before the maximum loading of the chain is reached. Whilst the problem is greater with softer chains it has been found that even high quality alloy chains

5 still fail in shear below their rated capacity.

#### DISCLOSURE OF THE INVENTION

It is an object of the invention to provide a chain engaging device which will overcome or

10 ameliorate at least some of the deficiencies of the prior art.

According to a first aspect of the invention there is provided a chain engaging device adapted to be releasably connected to a chain consisting of

15 adjacent orthogonal links, said device comprising:

a first surface defining a groove adapted to receive a portion of a first link;

a second surface including an area opposed to said groove and spaced from the first surface by a

20 distance greater than the maximum gap between the first link and an adjacent co-planar link, rotation of the link intermediate the first link and adjacent co-planar link when said portion of the first link is in said groove permitting movement of the

25 adjacent co-planar link between a first position in which the portion of the first link cannot be withdrawn from the groove due to the co-planar link

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interfering with said area of the second surface and a second position in which the portion of the first link can be withdrawn from the groove.

5 Preferably, the first surface and second surface are opposed faces of a single member and a slot provided in the single member is adapted to receive the intermediate link.

10 Preferably also, said single member includes a pair of juxtaposed load bearing elements, said load bearing elements spaced apart to at least partially define said slot.

15 Preferably also, when said adjacent co-planar link is in said second position, a portion of said adjacent co-planar link is received in a recess provided on said second surface, said recess facilitating a closeness of approach of said adjacent co-planar link to said groove sufficient to permit withdrawal of said portion of said first link from the groove.

20 Preferably also, when said portion of said adjacent co-planar link is received in said recess the intermediate link can pivot about the adjacent co-planar link between a third position corresponding to the second position and a fourth position in which the first link is clear of the chain engaging device.

25

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Preferably also, a detent mechanism is provided to selectively retain the first link in the groove. The detent mechanism may conveniently bear on the intermediate link or, alternatively, may prevent the adjacent co-planar link from moving to said second position.

According to a second aspect of this invention there is provided a chain engaging device adapted to be releasably connected to a chain consisting of adjacent orthogonal links, said device comprising:

a groove adapted to receive portions of a first link, a slot extending generally transversely through said groove to accommodate an adjacent link of the chain, said groove being partly formed by a protuberance extending into said slot to allow said groove to support part of that portion of said first link immediately opposite the portion engaged by the adjacent link when the chain is under load.

It will be apparent that this configuration avoids the tendency for the first link to fail in shear as a result of the action between the edges of the slot and the adjacent link which occurs in the prior art devices.

The chain engaging devices according to this invention are sized to suit the dimension of the link (and in particular the thickness) of the chain with which they are to be used. Preferably, the



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protrusion or extension of the slot is approximately 25% of the thickness of the chain.

5 It will be apparent that in order to provide the protrusion but still allow accommodation of the adjacent link the slot must be appropriately widened. This widening can extend over the full dimensions of the slot or be confined to a region sufficient to allow placement of the first link within the groove.

10 Preferably, a manually operable detent mechanism is provided to selectively retain the first link in the groove.

#### BRIEF DESCRIPTION OF THE DRAWINGS

15 Preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is an orthogonal view of a conventional D-shackle.

20 Figure 2 is an orthogonal view of a Clevis claw hook.

Figure 3 (A)-(D) is a series of orthogonal views of a first embodiment of a chain engaging device according to the first aspect of the invention.

25 Figure 4 (A)-(D) is a series of orthogonal views of a second embodiment of a chain engaging

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device according to the first aspect of the invention.

5 Figure 5 (A)-(D) is a series of views of a combination of the first and second embodiments to form a coupling showing the sequential engagement of a first chain with the first embodiment of the invention and of a second chain with the second embodiment of the first aspect of the invention.

10 Figure 6 is a view of the combination of Figure 5 showing how the second embodiment of the first aspect of the invention can slide along a chain.

Figure 7 is a series of views of a combination of a pair of third embodiments according to the first aspect of the invention.

15 Figure 8 is a front view of a prior art claw hook;

Figure 9 is a sectional view along the line 9-9 of Figure 8;

20 Figure 10 is a schematic view in the direction 10-10 shown in Figure 9 of a claw hook according to the second aspect of the invention;

Figure 11 is a schematic sectional view in the direction of 11-11 of Figure 10;

25 Figure 12 is a plan view of another chain engaging device incorporating the second aspect of the invention;

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Figure 13 is an elevation of the device shown in Figure 12;

Figure 14 is a sectional view along the line 14-14 of Figure 12; and

5        Figure 15 is a sectional view along the line 15-15 of Figure 12.

MODES FOR CARRYING OUT THE INVENTION

Referring to Figures 3 (A)-(D), there is illustrated a first embodiment of a chain engaging  
10        device 2 according to the first aspect of the invention comprising a pair of juxtaposed load bearing elements 4 defining a slot 6 therebetween. A groove 8 transverse with respect to slot 6 is provided on surface 10 of load bearing elements 4.  
15        Groove 8 is adapted to receive a portion of a link of a chain. Recess 12 is provided on the opposite surface 14 of load bearing elements 4. Recess 12 is also adapted to receive a portion of a link of a chain. Detent mechanism 16 is pivotable about point  
20        18 between an unlocked position (illustrated) and a locked position in which it prevents a link from entering recess 12.

Referring now to Figures 4 (A)-(D), wherein the same numbering system is used as in Figure 3, there  
25        is shown a second embodiment of the first aspect of the invention. This embodiment is similar to the first embodiment in that it comprises a pair of

- 10 -

juxtaposed load bearing elements 4 having a groove 8 on one surface and a recess 12 on the opposed surface. However, this embodiment includes a superstructure 15, 21 adapted to allow the device to  
5 slide along the length of the chain when disengaged (as described in more detail hereunder). In this embodiment, detent mechanism 16 is slidable between a locked position (illustrated) and an unlocked position wherein scallop profile 20 is axially  
10 aligned with slot 6. Alternatively, detent mechanism 16 may be fixed against sliding so that scallop profile 20 is axially aligned with slot 6. The device is then locked by rotation of detent mechanism 16 about its longitudinal axis.

15 The operation of the invention will now be described with reference to Figure 5, wherein the same numbering system is used as previously, which illustrates the first and second embodiments of the first aspect of the invention in combination to form  
20 a coupling.

Turning firstly to the left hand end of Figure 5C and 5D there is shown a chain 22 being connected to the first embodiment of the first aspect of the invention. In use, link 24 is initially inserted  
25 into recess 12. In this position, intermediate link 26 can be pivoted about link 24 over the end 30 of load bearing member 4. Intermediate link 26 is then

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further pivoted to dispose link 28 in groove 8 as is shown in Figure 5D. Referring to Figure 5D, it will be appreciated that, in order to securely retain link 28 in groove 8, the vertical dimension or  
5 thickness of load bearing element 4 is greater than the maximum gap between adjacent co-planar links such that link 28 cannot be withdrawn from groove 8 unless link 24 is received in recess 12. Detent mechanism 16 (not illustrated in Figure 5) can be  
10 pivoted to prevent link 24 from entering recess 12. To decouple chain 22 from the engaged position illustrated in Figure 5D, detent mechanism 16 is unlocked and intermediate link 26 is pivoted about link 28 until a portion of link 24 is disposed  
15 within recess 12 (as illustrated in Figure 5C). Having reached this position, intermediate link 26 is then pivoted in the opposite direction about link 24 such that link 28 is withdrawn from groove 8 and is pivoted clear over the ends 30 of load bearing  
20 element 4. Having reached this position, the chain may be directly disengaged from recess 12.

Referring now to the second embodiment of the first aspect of the invention shown in Figure 5D there is shown a second chain 40 engaged in groove  
25 8. Detent mechanism 16 prevents upward movement of intermediate link 44 and thus prevents withdrawal of link 46 from groove 8. To disengage chain 40 from

- 12 -

the coupling, detent mechanism 16 is withdrawn and intermediate link 44 is pivoted about link 46 until link 48 is disposed within recess 12 (as illustrated in Figure 5C). Having reached this position, link  
5 46 can be moved upward over the lip of groove 8 (as illustrated in Figure 5C) and slid out between superstructure 15, 21 (as illustrated in Figures 5B and 5A).

Referring again to Figure 5D, arrows are shown  
10 representative of tensile forces applied to chains 22 and 40. It will be appreciated that the forces tend to drive link 28 and link 46 more firmly into engagement with respective grooves 8. With reference to the first embodiment of the first  
15 aspect of the invention as shown in Figure 5D, ends 30 of load bearing members 4 are upturned such that when chain 22 is tensed in the direction generally indicated by the attitude of link 24, link 24 abuts the end of load bearing element 4 and creates a  
20 reactive force in the direction of the arrow which tends to drive link 28 into engagement with groove 8. Furthermore, when the construction shown in Figure 5 is used to join two chains in tension upturned ends 30 cause the coupling as a whole to  
25 rotate slightly (about 20°) away from the direction of the tensile force as compared to a construction wherein the ends are not upturned.

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The function of superstructure 15, 21 will be appreciated with reference to Figures 4 (A)-(D) and 6. With the chain threaded intermediate superstructure 15, 21 as shown in Figure 6, the device can be slid along the length of the chain and then fixed at a desired position as described above. Certain angles of geometry have been found to be particularly advantageous to the sliding of the device. For example surface 17 is inclined with respect to the horizontal by about 22°. Similarly, surface 19 is inclined with respect to the vertical by about 9°.

Other preferred geometric features of note are that edges 7 of groove 8 (refer to Figure 3) are radiused to avoid localised contact with a link received therein, such localised contact potentially causing the shearing of the received link.

Furthermore, with reference to Figure 5D, it will be noted that superstructure 15, 21 provides sufficient clearance such that link 47 is relatively free to pivot about link 46 thereby facilitating the forming of loops around both small and large diameter objects. For example, link 47 could be directly joined to link 24 to form a particularly small loop. Alternatively, link 47 and link 24 may have a large number of links therebetween extending around a large diameter object. In this case link

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47 would pivot outwardly (to the right) to accommodate the large diameter object. The limits of movement of link 46 are defined by the superstructure 15, 21 which thus becomes load bearing in the case of loops formed around small or large objects in which the chain extends at angles outside the range of movement allowed by superstructure 15, 21.

As will be apparent, in practice a combination of two chain engaging devices are required to form a coupling as in Figure 5 to join two chains together or form a loop in a chain. However, the device according to the invention may be used individually or in combination with other devices such as D-shackles.

The embodiment illustrated in Figure 7, wherein the same numbering system is used as previously, is particularly suitable for joining two lengths of chain end to end as shown in dashed lines. This embodiment comprises a pair of chain engaging devices wherein the ends 30 of load bearing members 4 are not upturned but rather include cavities 31 adapted to receive links as shown in Figure 7(B).

Prototypes of the chain engaging device have been made from steel alloys that can be heat treated to a hardness corresponding to approximately 45



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Rockwell C. It is anticipated that casting would be the most expedient form of manufacturing.

Referring to Figures 8 and 9 there is shown a prior art chain engaging hook 51. This device is typically permanently connected to a chain or any other appropriate item via a pin 52 in the upper portion hook 51. Two hook arms 53, 54 are formed in the lower part of the hook 51 and are spaced apart by a slot 55 which extends transversely through a chain receiving groove formed in two parts 56a and 56b respectively in each hook arm 53, 54. It will be apparent that the groove 56a, 56b receives a first link 57 of a chain 58 and supports spaced apart portions of the link by abutment therewith. The adjacent link 59 in the chain 58 is accommodated within the slot 55. A detent mechanism 60 which will not be described in detail bears against the adjacent link 59 to captively retain the first link 57 in engagement with the groove 56a, 56b.

Figures 10 and 11 show the hook of Figures 8 and 9 as modified to incorporate the second aspect of the invention. A protrusion 61 is formed on one side of the slot 55 so that the groove 56b is extended. The slot 55 is correspondingly widened adjacent the protuberance 61 to allow the adjacent link 59 to pass through during engagement of the first link with the groove. As is best seen in

- 16. -

Figure 11, this results in the groove 56b supporting that part of the portion of the first link 57 immediately opposite the portion which is engaged by the adjacent link 59 when the chain 58 is under load. Also, the portion of the first link 57 that is supported by the second part of the groove 56b is spaced apart from the area immediately opposite that engaged by the adjacent link 59 when the chain 58 is under load. In this way, the ability for the first link to be sheared by the edges of the groove 56a, 56b and the adjacent link found in the prior art devices is avoided. Consequently, the chain engaging device of the second aspect of the invention is able to provide an arrangement which will exceed the rated strength of the chain. This gives superior results with high quality alloy chains and vastly superior with somewhat softer chains because of the tendency of these chains to shear more readily.

Figures 12 to 15 show a chain coupling device according to the first aspect of the invention incorporating the second aspect of the present invention. Those portions of the apparatus that directly correspond with the second aspect of the invention have been identified with the same reference numerals.

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Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

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## CLAIMS:-

1. A chain engaging device adapted to be releasably connected to a chain consisting of adjacent orthogonal links, said device comprising:

a first surface defining a groove adapted to receive a portion of a first link;

a second surface including an area opposed to said groove and spaced from the first surface by a distance greater than the maximum gap between the first link and an adjacent co-planar link, rotation of the link intermediate the first link and adjacent co-planar link when said portion of the first link is in said groove permitting movement of the adjacent co-planar link between a first position in which the portion of the first link cannot be withdrawn from the groove due to the co-planar link interfering with said area of the second surface and a second position in which the portion of the first link can be withdrawn from the groove.

2. A chain engaging device according to claim 1, wherein the first surface and second surface are opposed faces of a single member and a slot provided in the single member is adapted to receive the intermediate link.

3. A chain engaging device according to claim 2, wherein said single member includes a pair of

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juxtaposed load bearing elements, said load bearing elements spaced apart to at least partially define said slot.

4. A chain engaging device according to any one of claims 1 to 3, wherein when said adjacent co-planar link is in said second position, a portion of said adjacent co-planar link is received in a recess provided on said second surface, said recess facilitating a closeness of approach of said adjacent co-planar link to said groove sufficient to permit withdrawal of said portion of said first link from the groove.

5. A chain engaging device according to claim 4, wherein when said portion of said adjacent co-planar link is received in said recess, the intermediate link can pivot about the adjacent co-planar link between a third position corresponding to the second position and a fourth position in which the first link is clear of the chain engaging device.

6. A chain engaging device according to any one of the preceding claims, wherein a detent mechanism is provided to selectively retain the first link in the groove.

7. A chain engaging device according to claim 6, wherein the detent mechanism bears on the intermediate link.

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8. A chain engaging device according to claim 6, wherein the detent mechanism prevents the adjacent co-planar link from moving to said second position.
9. A chain engaging device according to claim 3, wherein the ends of the pair of juxtaposed load bearing elements are upturned such that the second surface is concave.
10. A chain engaging device according to any one of claims 2 to 9, wherein the single member is provided with a superstructure, said superstructure adapted to slidably receive a chain.
11. A chain engaging device as claimed in claims 10, wherein said superstructure provides load bearing surfaces to define the limits of rotation of the first link.
12. A chain engaging device adapted to be releasably connected to a chain consisting of adjacent orthogonal links, said device comprising:
  - a groove adapted to receive portions of a first link, a slot extending generally transversely through said groove to accommodate an adjacent link of the chain, said groove being partly formed by a protuberance extending into said slot to allow said groove to support part of that portion of said first link immediately opposite the portion engaged by the adjacent link when the chain is under load.

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13. A chain engaging device as claimed in claim 12 wherein the protrusion or extension of the slot is approximately 25% of the thickness of the chain.

14. A chain engaging device as claimed in claims 12 or 13 wherein a manually operable detent mechanism is provided to selectively retain the first link in the groove.

15. A chain engaging device as claimed in any one of claims 12 to 14 wherein the slot is widened to accomodate an adjacent link of the chain along the slots entire length.

16. A chain engaging device as claimed in any one of claims 12 to 14 wherein the slot is widened to accomodate an adjacent link of the chain only in a region in the slot sufficient to allow placement of the first link.

17. A chain engaging device adapted to be releasably connected to a chain consisting of adjacent orthogonal links, said device comprising:

a first surface defining a groove adapted to receive a portion of a first link;

a second surface including an area opposed to said groove and spaced from the first surface by a distance greater than the maximum gap between the first link and an adjacent co-planar link, rotation of the link intermediate the first link and adjacent co-planar link when said portion of the first link is in said groove permitting movement of the

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adjacent co-planar link between a first position in which the portion of the first link cannot be withdrawn from the groove due to the co-planar link interfering with said area of the second surface and a second position in which the portion of the first link can be withdrawn from the groove,

further comprising a slot extending generally transversely through said groove to accommodate an adjacent link of the chain, said groove being partly formed by a protuberance extending into said slot to allow said groove to support part of that portion of said first link immediately opposite the portion engaged by the adjacent link when the chain is under load.

18. A chain engaging device according to claim 17, wherein the first surface and second surface are opposed faces of a single member and a slot provided in the single member is adapted to receive the intermediate link.

19. A chain engaging device as claimed in claims 17 or 18 wherein a manually operable detent mechanism is provided to selectively retain the first link in the groove.

20. A chain engaging device substantially as herein before described with reference to Figure 3, Figure 4, Figures 5 and 6, Figure 7, Figure 10 and 11, Figure 12-15.



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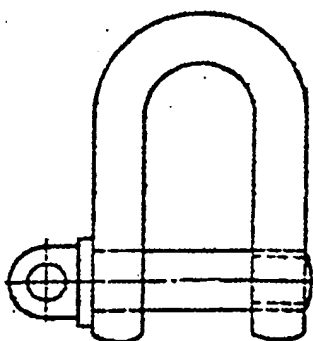


FIG. 1

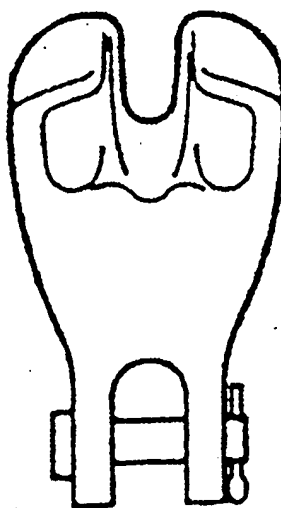
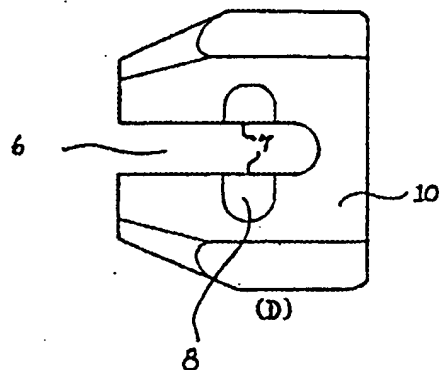
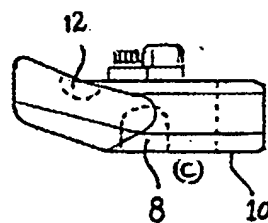
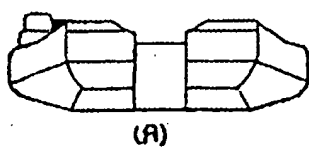
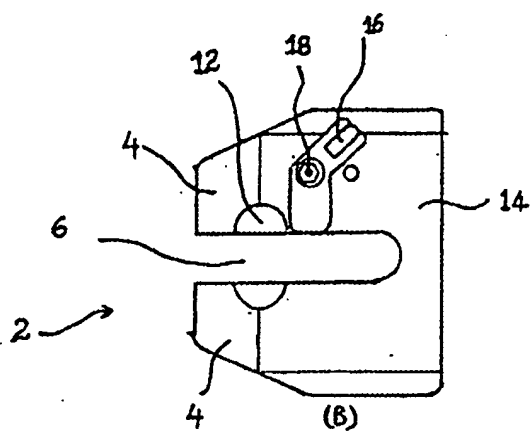


FIG. 2

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FIG. 3



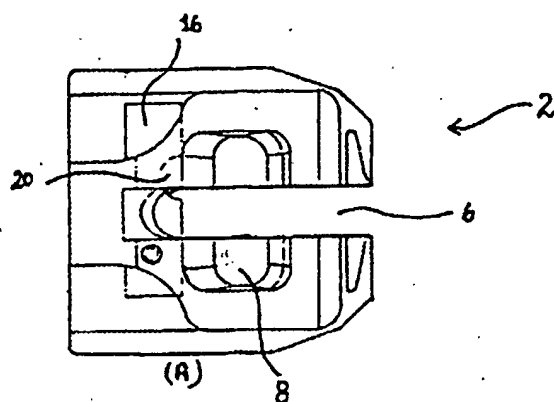
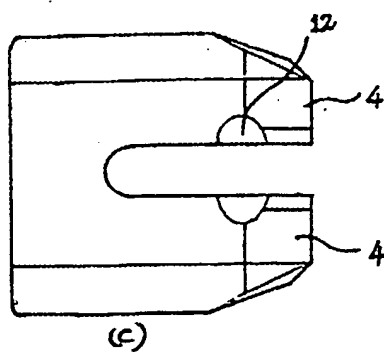
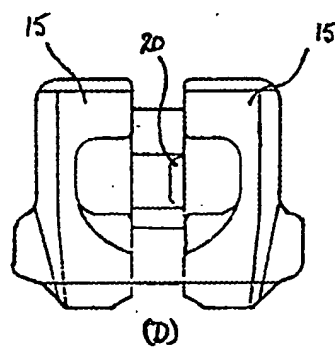
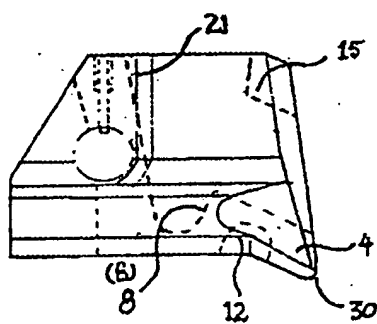
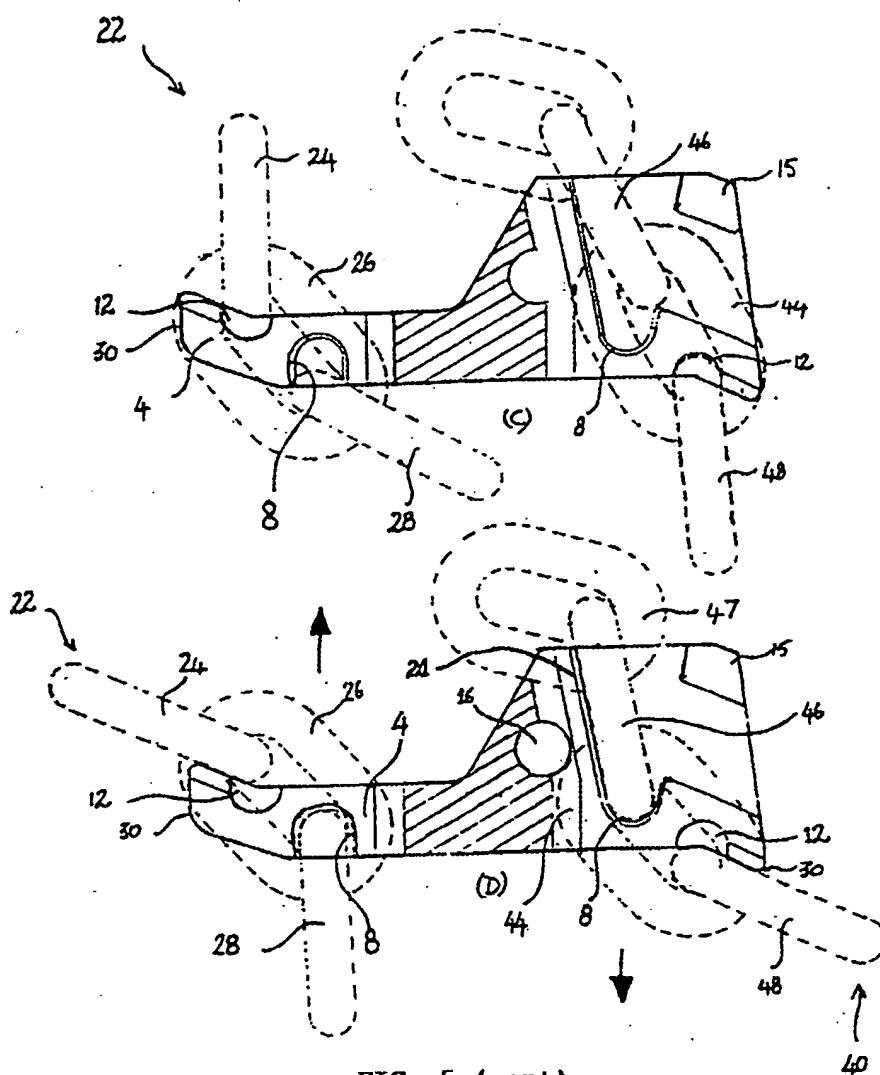


FIG. 4





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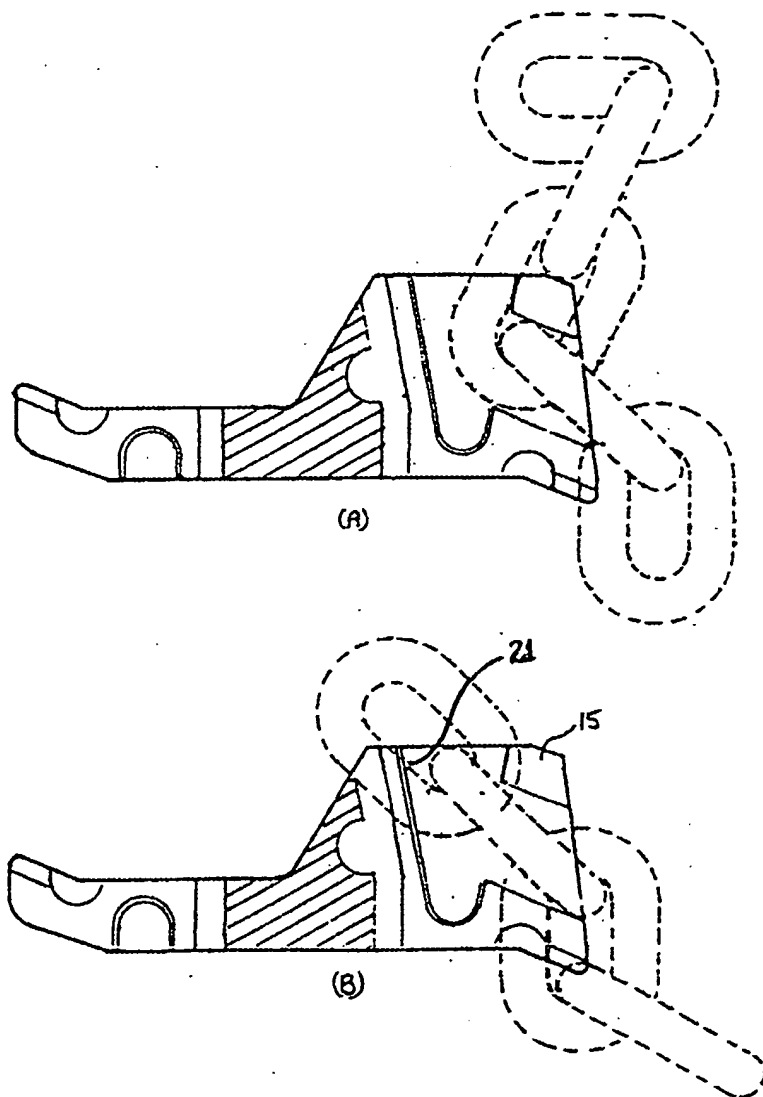


FIG. 5

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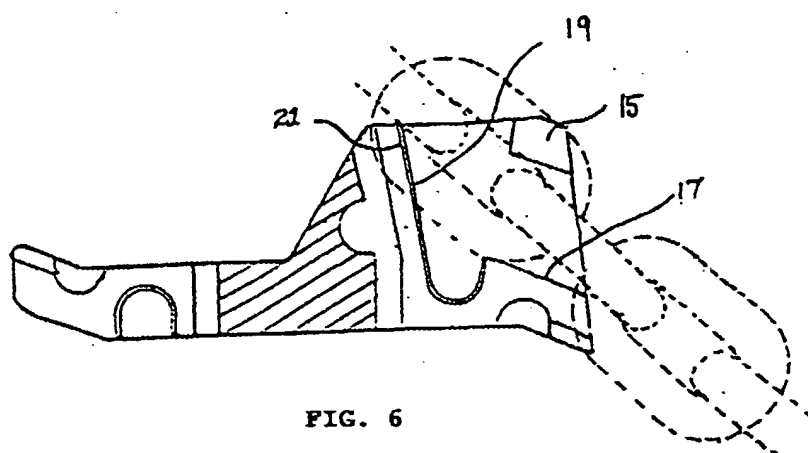
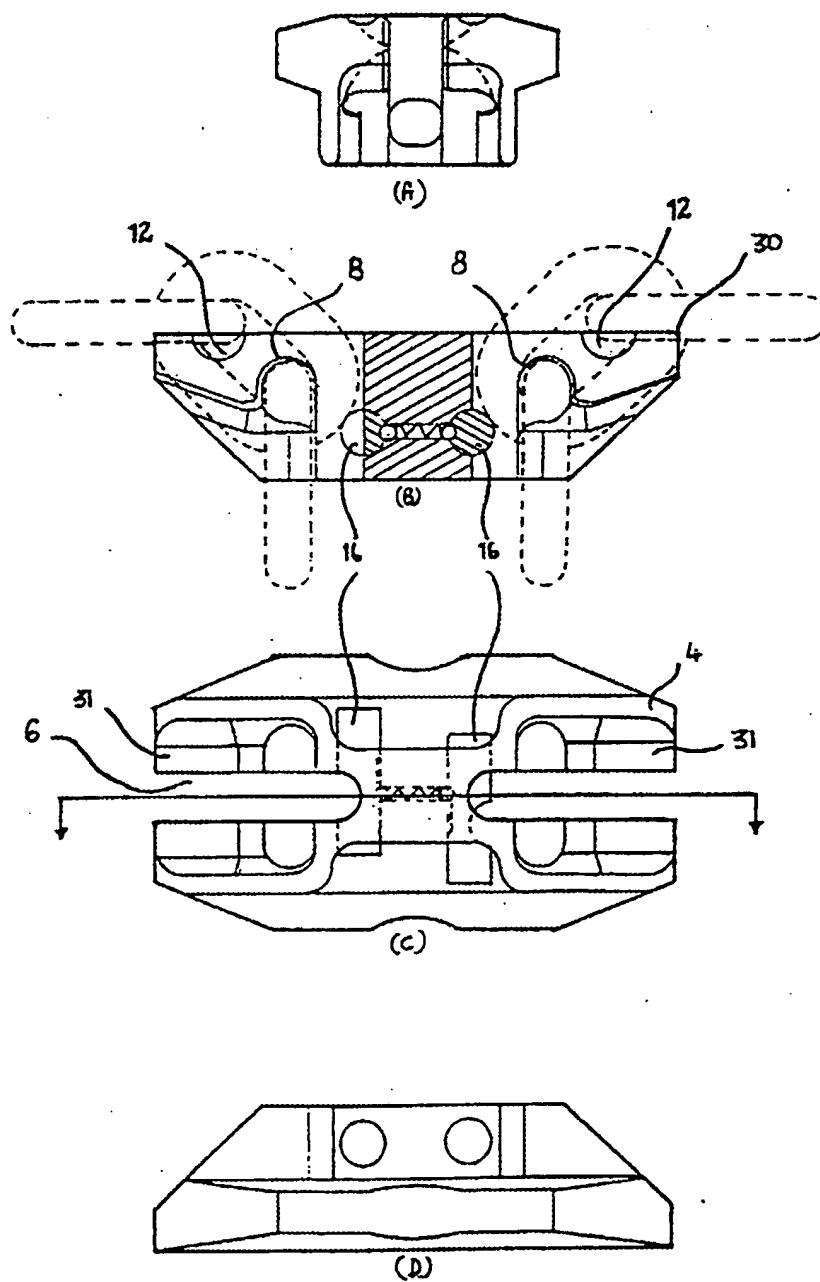


FIG. 6

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FIG. 7



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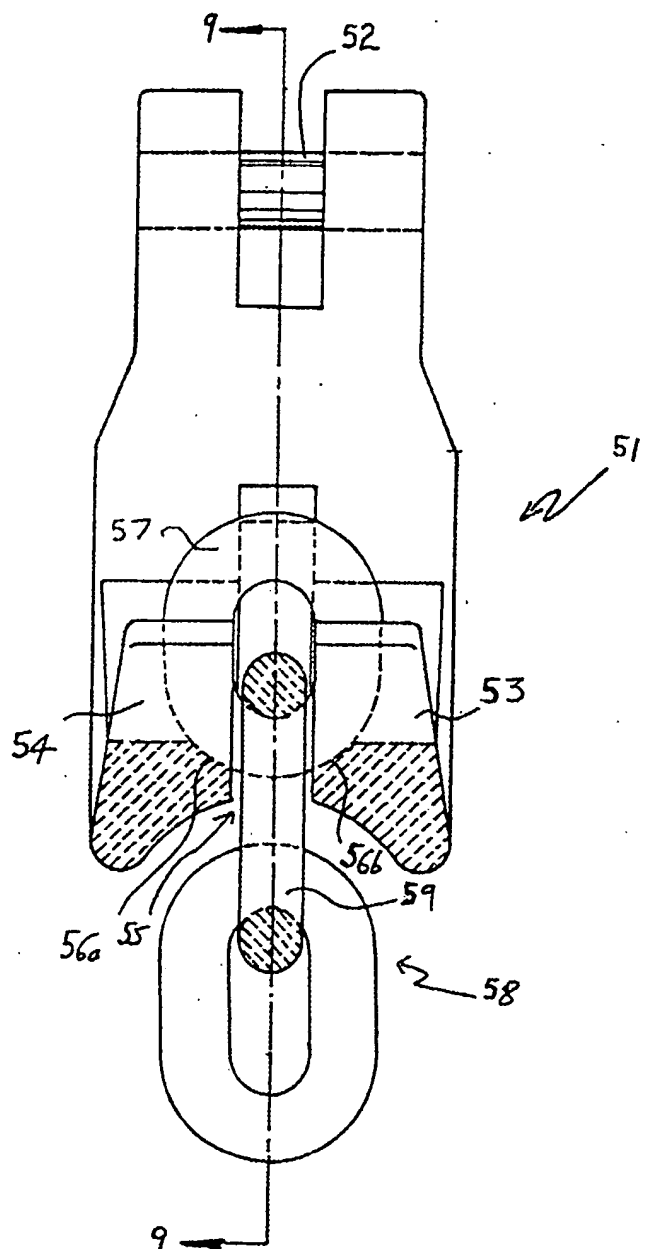


FIG. 8



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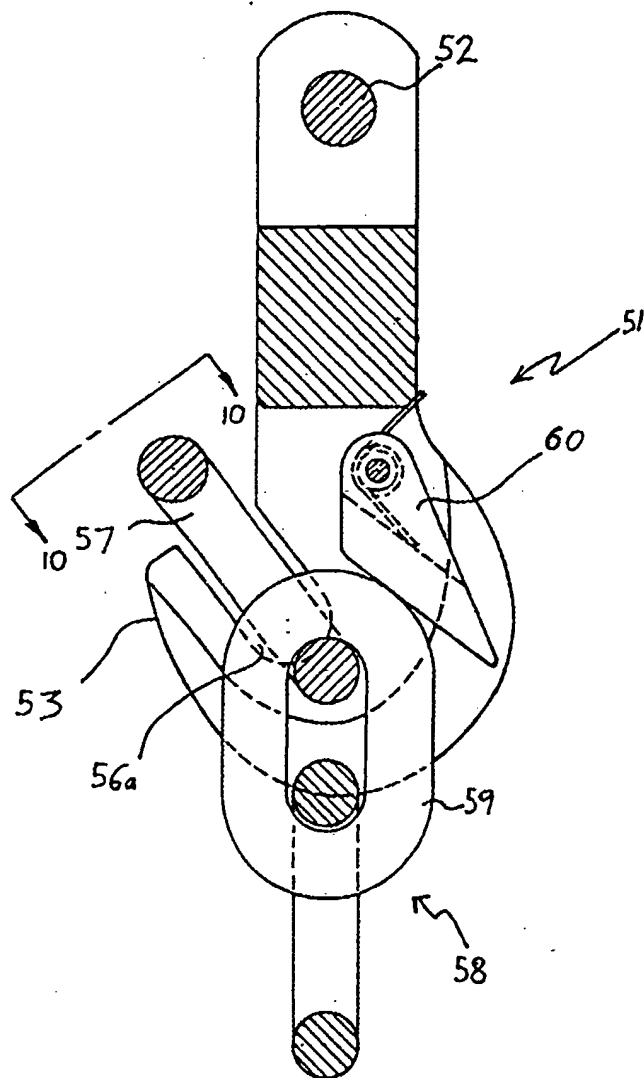


FIG. 9

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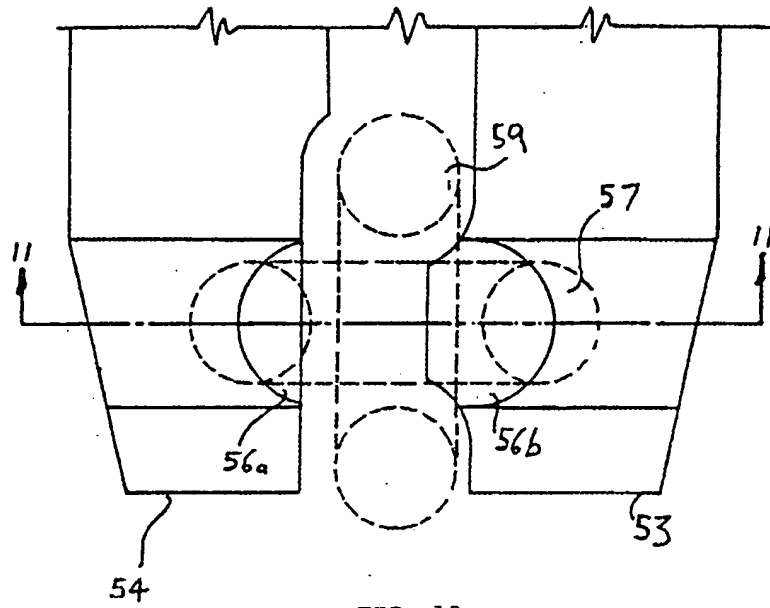


FIG. 10

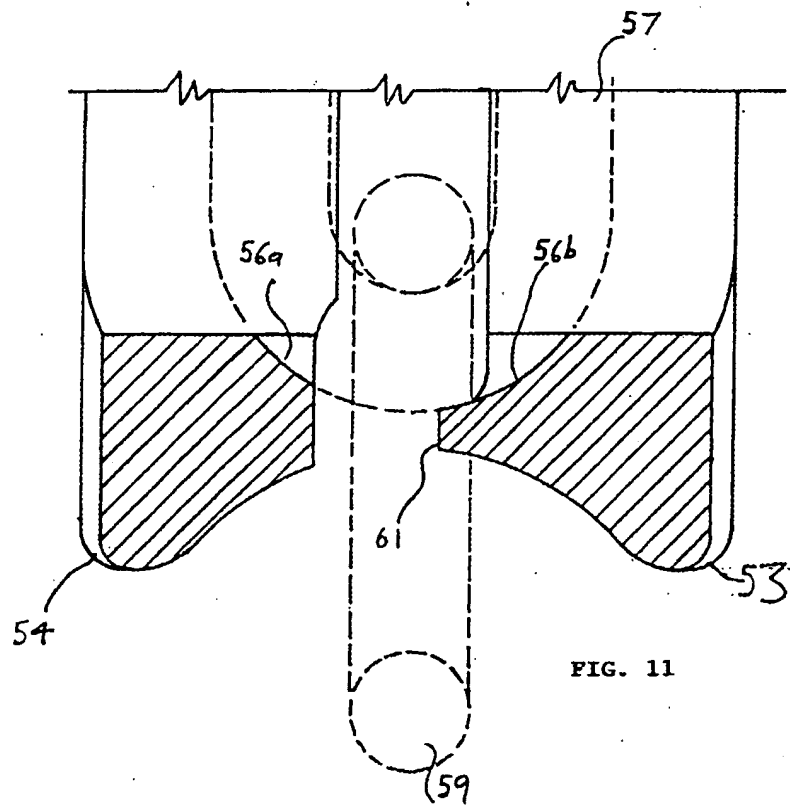


FIG. 11

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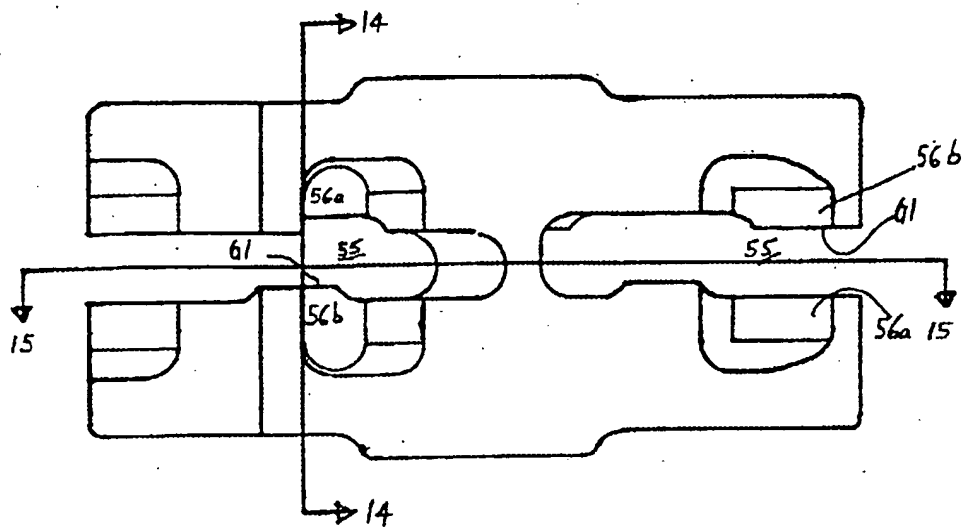


FIG. 12

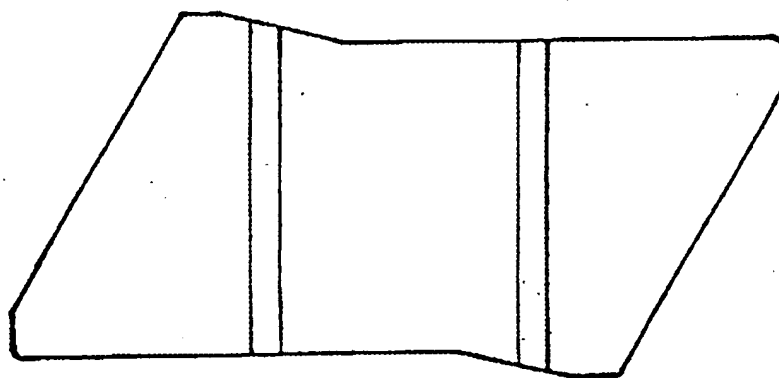
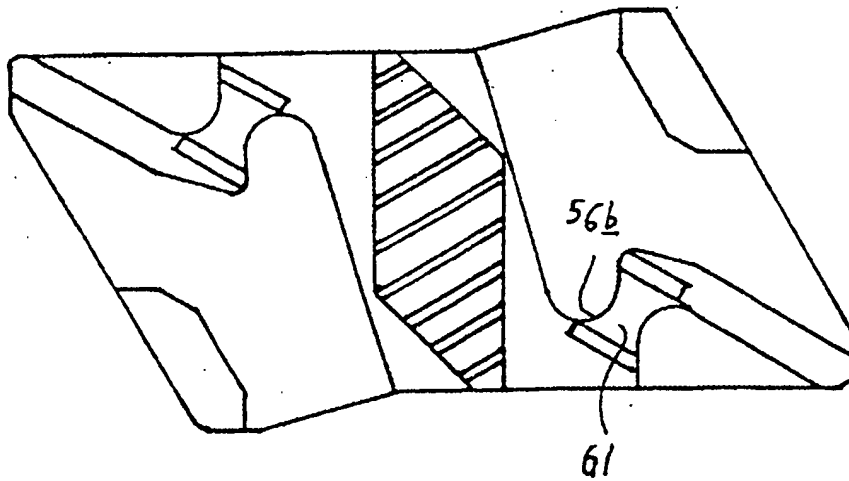
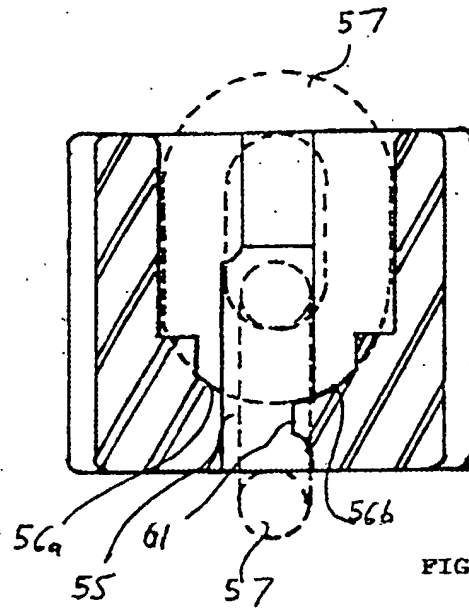


FIG. 13


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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 94/00218

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int. Cl. <sup>5</sup> F16G 15/04  According to International Patent Classification (IPC) or to both national classification and IPC				
<b>B. FIELDS SEARCHED</b>  Minimum documentation searched (classification system followed by classification symbols) IPC : F16G 15/04  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : IPC F16G 15/04  Electronic data base consulted during the international search (name of data base, and where practicable, search terms used) JAPIO DERWENT				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.		
A	FR,A, 1598369 (EISEN-UND DRAHTWERK ERLAU AG) 14 August 1970 (14.08.70) See Figures	1-5		
A	US,A, 360198 (RIEGER et al) 31 August 1971 (31.08.71)			
X	DE,A, 2807103 (NORDIN) 31 August 1978 (31.08.78) See Figures			
A	AU,B, 24543/71 (458266) (BRITISH STEEL CORP) 27 July 1972 (27.07.72)			
A	JP,A, 52/52059 (MAKINO) 26 April 1977 (26.04.77)			
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
<table border="0"> <tr> <td>           * Special categories of cited documents :            "A" document defining the general state of the art which is not considered to be of particular relevance            "E" earlier document but published on or after the international filing date            "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)            "O" document referring to an oral disclosure, use, exhibition or other means            "P" document published prior to the international filing date but later than the priority date claimed         </td> <td>           "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention            "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone            "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art            "&amp;" document member of the same patent family         </td> </tr> </table>			* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
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Date of the actual completion of the international search 16 August 1994 (16.08.94)		Date of mailing of the international search report 19 AUG 1994 ( 19.08.94 )		
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA  Facsimile No. 06 2853929		Authorized officer   D. LUM  Telephone No. (06) 2832544		

**Box I** Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international search report has not established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II** Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The common features between claims 1, 12 and 17 are

a chain engaging device adapted to be releasably connected to a chain consisting of adjacent orthogonal links,  
a first surface defining a groove adapted to receive a portion of a first link.

These common features are disclosed in the citations DE 2807103 and FR 1598369; hence the application lacks Unity of Invention and does not comply with PCT rule 13.1.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
US	3601978	AT	288793	BE	738686	CH	513348
		DE	1775813	FR	2018995	NL	6914663
		NL	140605	NO	125744		
FR	1598369	AT	287417	AT	295256	CH	504635
DE	2807103	AT	132478	AT	361746	CH	621611
		FI	780587	NO	780607	SE	7702048
		SE	417545				
END OF ANNEX							

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